

REMARKS

Claims 3-5, 7-14 and 17-29 are pending in the present application, and claim 25 has been amended. Accordingly, claims 3-5, 7-14 and 17-29 are currently under consideration. The subject matter of amended claim 25 is described at e.g. paragraphs 30-36 of the specification. Amendment of claims is not to be construed as a dedication to the public of any of the subject matter of the claims as previously presented. No new matter has been added.

The previous indication of allowability of the pending claims was withdrawn in view of newly-cited references. Applicants submit that the present claims are patentable over the recently-cited art.

Each of the bases for rejection of the claims is addressed below.

Rejections under 35 USC § 101

Claim 25-29 were rejected under 35 USC § 101 because the claimed invention was allegedly directed to non-statutory subject matter. The Office Action states that the rejection could be overcome by reciting production of the optimized pad as a step in the claimed method.

Independent claim 25 has been amended as suggested in the Office Action, although the amendment is made in order to expedite prosecution and without acquiescence in the rejection. Claim 25 recites a method of making a pad, in which the pad is formed based on selecting a value for one or more physical properties of the pad to compensate for pattern density effects of different chip or substrate architectures, and optimizing the pad for a derived planarization length, response characteristics for dishing and/or erosion, or final step height at specific pattern features to attain local and global planarization of the chip or substrate. Applicants submit that the basis for the rejection has been obviated and therefore request withdrawal of the rejection. Since claims 26-29 depend upon claim 25 either directly or ultimately, the amendments to claim 25 likewise address the rejection of claims 26-29.

Rejections under 35 USC § 102

Claims 3-5, 7, 17, 18, and 25-28 were rejected under 35 USC § 102(b) as allegedly being anticipated by Runnels, U.S. Pat. No. 6,169,931. The Office Action states that “‘931 discloses a method of customizing a polishing pad for mechanical planarization of a substrate” and specifically cites figures 1 and 9, column 3 line 22 through column 4 line 29 and the description of figures 1 and 9 as the basis for rejection.

Applicants respectfully traverse the Office’s conclusion that Runnels discloses a method of customizing a polishing pad. Runnels does not disclose such a method. Instead, Runnels discloses a method of “modeling, predicting and optimizing a Chemical Mechanical Polishing ... system for polishing semiconductor wafers and other types of substrates” (abstract).

Runnels models what happens to a pad during the CMP process in order to determine “optimal recipe settings for the CMP process” (abstract). Runnels’ “recipe” relates to a method of optimizing the CMP process as practiced by e.g. a chip manufacturer, not to a method of customizing a pad as is typically performed by pad manufacturers.

In Runnels’ patent, Runnels is interested in modeling the CMP process based on such actions as are performed by the user of CMP equipment during chemical mechanical planarization. Runnels therefore accounts for factors such as type of pad used, pad wear, and pad conditioning as well as such factors as pressure during planarization in order to formulate a “recipe” for the CMP process to optimize the CMP process itself. This can lead to the benefit of increased pad life (e.g. col. 3 lines 7-21) during chemical mechanical planarization because of CMP conditions themselves having been optimized. However, Runnels does not discuss how to customize a pad based on information obtained from simulating the CMP process or based on the CMP equipment user’s recipe used to simulate or carry out the CMP process, and thus Runnels does not select a value for one or more chemical or physical properties for a pad to be manufactured based on the characteristics of structures on the substrate as specified in respective claims.

For instance, Runnels in discussing Figure 1 at col. 9 lines 12-37 states

The pad wear performance predictions 111 use the uniformity and planarity model results, along with the pad conditioning and wear model results to predict pad wear and determine pad life. This is used to optimize pad life in the CMP process 113. Optimization may be accomplished in various ways. Pad conditioning and wear performance predictions can be used to optimize pad life by changing the initial pad thickness, including the top pad stiffness or base pad compressibility; by determining the optimal time to roughen or condition the pad to maintain more constant uniformity results; and by determining the optimal frequency of conditioning of the pad to extend pad life. In addition, CMP process recipe settings may be varied 114, such as changing the pressure or speed settings of the tool configuration or varying the geometric configuration of the CMP polish tool such as the pad inner/outer radii and the sweep arm. After optimization has determined various pad parameter changes and optimal recipe settings, the new parameters and settings can be input to the pad conditioning and wear modeling system 100 to repeat the process and determine new uniformity, planarity and throughput predictions based upon the new configuration to further optimize and extend pad life. Optimization allows the user to select any of these variables to vary and to repetitively exercise the pad conditioning and wear modeling system 100.

Runnels' statements above in explaining Runnels' figure 1 as well as Runnels' comments at col. 3 line 22 – col. 4 line 29 relate to optimizing the CMP process as a chip manufacturer might do utilizing pads purchased from a pad manufacturer, not to a method of customizing a pad to be manufactured as would be performed by e.g. a pad manufacturer.

Runnels' comments pertaining to figure 9 at col. 14 lines 10-33 likewise indicate that Runnels is concerned with optimizing the CMP process, not with customizing a pad. Runnels sets the CMP recipe (e.g. changing the pressure or speed settings of the tool configuration or varying the geometric configuration of the CMP polish tool such as the pad inner/outer radii and the sweep arm

as discussed in the portion of Runnels' specification quoted above) in order to optimize pad life as well as the chemical mechanical polishing conditions that lead to improved wafer-scale and feature-scale planarity (pad optimization). Runnels is concerned with establishing the ideal operating parameters for a CMP apparatus (Runnels' "recipe") to optimize planarization and pad life, and Runnels does not suggest the entirely different method of customizing a polishing pad that provides better planarity.

Since Runnels discloses a method of optimizing the CMP process and not a method of customizing a polishing pad for chemical mechanical planarization as claimed in Applicants' pending claims in which a value for one or more chemical or physical properties for a pad to be manufactured are selected based on the characteristics of structures on the substrate as specified in respective claims, Runnels cannot anticipate the claims under 35 U.S.C. Sec. 102(b). Consequently, Applicants respectfully request withdrawal of the rejection.

Rejections under 35 USC § 103

Claims 8-14 and 19-24 were rejected under 35 USC § 103(a) as allegedly being unpatentable over Runnels U.S. Pat. No. 6,169,931 in view of Sonderman et al, U.S. Pat. No. 6,802,045. Applicants respectfully traverse the rejection.

Even if the disclosures of Runnels and Sonderman et al. are combined, the combined disclosure does not teach or suggest the subject matter of the claims. Sonderman et al. adds no pertinent subject matter to Runnels that Runnels lacks. Sonderman et al. discloses a method for integrating a simulation environment (such as simulation of a method of chemical mechanical planarization as specified in Sonderman et al.'s claim 6) into a production environment (e.g. abstract and col. 1 lines 9-12 of Sonderman et al.). Sonderman et al., like Runnels, fails to disclose or suggest customizing a polishing pad for chemical mechanical planarization in which a value for one or more chemical or physical properties for a pad are selected based on the characteristics of structures on the substrate as specified in respective claims. Runnels in view of Sonderman et al. therefore fails to disclose all features of the claimed subject matter, since the references when

combined still fail to disclose a method of customizing a polishing pad as specified in any of the claims. Since Runnels in combination with Sonderman et al. fail to disclose or suggest a method of customizing a polishing pad as specified in the rejected claims, Runnels in combination with Sonderman et al. cannot render obvious Applicant's claimed method of customizing a polishing pad.

In view of the above, Runnels in view of Sonderman et al. cannot render unpatentable a method of customizing a polishing pad as defined in claims 8-14 and 19-24. Applicants therefore respectfully request withdrawal of the rejection of these claims.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to *Deposit Account No. 03-1952* referencing docket no. 577182000100. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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